<u>What is claimed is</u>:

1. Distortion compensating apparatus including a pre-distortion unit for applying a distortion compensation processing to an input signal by using a distortion compensation coefficient, a distortion compensation coefficient arithmetic unit for calculating a distortion compensation coefficient on the basis of said input signal before said distortion compensation processing and a feedback signal sent from an output side of a device in which a distortion generates, and a distortion compensation coefficient memory for storing the calculated distortion compensation coefficient in correspondence with said input signal, comprising;

a delay time decision unit for calculating the correlation between said input signal and said feedback signal while varying the phase difference between both signals, and deciding the total delay time caused in said device and a feedback loop on the basis of the phase difference in which said correlation is the maximum; and

a delay unit for delaying said input signal by the decided delay time, and inputting the delayed input signal into said distortion compensation coefficient arithmetic unit.

2. Distortion compensating apparatus including a pre-distortion unit for applying a distortion compensation processing to a transmission signal by using a distortion compensation coefficient at sampling period of the transmission signal, a distortion compensation coefficient arithmetic unit for calculating a distortion compensation coefficient on the basis of said transmission signal before said distortion compensation processing and a feedback signal sent from an output side of a transmission power amplifier, and a distortion compensation coefficient

memory for storing the calculated distortion compensation coefficient in correspondence with said transmission signal, comprising:

a delay time decision unit for calculating the correlation between said transmission signal and said feedback signal while varying the phase difference between both signals, and deciding the total delay time caused in said transmission power amplifier and a feedback loop on the basis of the phase difference in which said correlation is the maximum; and

a transmission signal delay unit for delaying said transmission signal before said distortion compensation processing by the decided total delay time, and inputting the delayed transmission signal into said distortion compensation coefficient arithmetic unit.

3. A distortion compensating apparatus according to Claim 2, further comprising: a delay circuit in which a delay time is set so as to adjust the timing of each part of said distortion compensating apparatus;

wherein said delay time decision unit sets said decided total delay time in said delay circuit.

4. A distortion compensating apparatus according to Claim 2, wherein said delay time decision unit includes:

an arithmetic unit for periodically calculating the correlation between said transmission signal and said feedback signal during a distortion compensating operation, and calculating the difference between the delay time at which said correlation is the maximum and said decided total delay time; and

a means for stopping said distortion compensating operation or distortion compensation coefficient updating operation so as to decide said total delay time

again and reset decided total delay time in said transmission signal delay unit, when said difference is not less than a preset value.

5. A distortion compensating apparatus according to Claim 2, wherein said delay time decision unit includes:

a means for monitoring the phase difference between said transmission signal and said feedback signal during a distortion compensating operation; and

a means for stopping said distortion compensating operation or distortion compensation coefficient updating operation so as to decide said total delay time again and reset said total delay time in said transmission signal delay unit, when said difference exceeds a certain threshold value.

6. A distortion compensating apparatus according to Claim 2, wherein said delay time decision unit calculates the correlation between a known signal which is constantly transmitted and said feedback signal by varying the phase difference between both signals, and deciding said delay time on the basis of the phase difference in which said correlation is the maximum.

7. A distortion compensating apparatus according to Claim 2, wherein, at the time of deciding said total delay time, said delay time decision unit calculates the correlation between a training signal which is inserted into said transmission signal and said feedback signal by varying the phase difference between both signals, and decides said total delay time on the basis of the phase difference in which said correlation is the maximum.

8. A distortion compensating apparatus according to Claim 2, further comprising:

a DLL (Delay Locked Loop) circuit into which a signal output from said transmission signal delay unit and said feedback signal are input, and which

operates in such a manner that the phase difference between both signals is zero; and

a delay means for delaying the feedback signal based upon the output of said DLL circuit.

9. A distortion compensating apparatus according to Claim 2, wherein said delay time decision unit includes:

a correlator for sequentially varying the time difference between said transmission signal and said feedback signal at interval of a sampling time, and calculating the correlation between said transmission signal and said feedback signal in each time difference ; and

a control unit for setting the time difference in which said correlation is the maximum in said transmission signal delay unit as said total delay time caused in said transmission power amplifier and said feedback loop.

10. A distortion compensating apparatus according to Claim 9, wherein said delay time decision unit calculates said correlation between said transmission signal and said feedback signal by using a sliding correlator.

11. A distortion compensating apparatus according to Claim 2, wherein said delay time decision unit includes:

a means for obtaining correlation between said transmission signal and said feedback signal when said transmission signal is N–oversampled , by sequentially shifting the time difference between both signals at interval of N‐oversampling period(=N × oversampling period), and obtaining the first time difference in the unit of N–oversampling period in which the correlation is the maximum;

a means for calculating correlation between the transmission signal and the feedback signal in the vicinity of said first time difference by sequentially shifting the time difference between both signals at interval of the oversampling period, and obtaining the second time difference in the unit of oversampling period in which the correlation is the maximum; and

a means for determining said total delay time on the basis of first and second the time differences.

12. A distortion compensating apparatus according to Claim 9, wherein said delay time decision unit calculates said correlation between said transmission signal and said feedback signal by using a matched filter.

13. A distortion compensating apparatus according to Claim 9, wherein the filter length of said matched filter is shorter than the total amount of delay time caused in said transmission power amplifier and said feedback loop, and said total delay time is obtained by controlling calculation timing of the correlation between said feedback signal and said transmission signal.

14. A distortion compensating apparatus according to Claim 2, wherein said delay time decision unit includes:

a means for calculating said correlation between said transmission signal and said feedback signal by sequentially changing the time difference as the phase difference, at interval of a sampling period for one period of the transmission signal;

a means for calculating and storing correlations for each of a plurality of periods of said transmission signal;

a means for calculating average value of the correlations for said plurality of periods of said transmission signal for each time difference; and

a means for determining said total delay time on the basis of the time difference in which the average value is the maximum.

15. Distortion compensating apparatus including a pre-distortion unit for applying a distortion compensation processing to a transmission signal by using a distortion compensation coefficient at sampling period of the transmission signal, a distortion compensation coefficient arithmetic unit for calculating a distortion compensation coefficient on the basis of said transmission signal before said distortion compensation processing and a feedback signal sent from the output side of a transmission power amplifier, and a distortion compensation coefficient memory for storing the calculated distortion compensation coefficient in correspondence with said transmission signal, comprising:

a feedback signal delay unit for controlling the amount of delay of said feedback signal at interval of time shorter than the sampling period of said transmission signal;

a correlator for calculating the correlation between said transmission signal and said feedback signal by sequentially changing the time difference between both signals at interval of said sampling period;

a control unit for obtaining the amount of delay in said feedback signal delay unit and the time difference in which said correlation is the maximum, and determining the total delay time caused in said transmission power amplifier and a feedback loop on the basis of said amount of delay and said time difference; and

a transmission signal delay unit for delaying said transmission signal by said total delay time and inputting the delayed transmission signal into said distortion compensation coefficient apparatus arithmetic unit.

16. A distortion compensating apparatus according to Claim 15, wherein said control unit obtains the time difference in the unit of sampling period in which said correlation is the maximum, while the amount of delay in said feedback signal delay unit is kept constant, and then adjusts the amount of delay in said feedback signal delay unit in such a manner that said correlation is the maximum in the state in which said time difference between said transmission signal and said feedback signal in said correlator is fixed at said delay time.

17. A distortion compensating apparatus according to Claim 15, further comprising:

a delay circuit with a delay time set therein for adjusting the timing of each part of said distortion compensating apparatus;

wherein said control unit sets said total delay time in said delay circuit and adjusts said timing.

18. A distortion compensating apparatus according to Claim 15, wherein said control unit obtains the time difference in the unit of sampling period in which said correlation is the maximum, while the amount of delay in said feedback signal delay unit is kept constant, sets said time difference in said transmission signal delay unit, and then adjusts the amount of delay in said feedback signal delay unit in such a manner that said correlation is the maximum while fixing the time difference between said transmission signal and said feedback signal in said correlator at zero.

19. A distortion compensating apparatus according to Claim 15, wherein said feedback signal delay unit is an analog delay unit.

20. A distortion compensating apparatus according to Claim 15, wherein said feedback signal delay unit is an analog filter.

21. A distortion compensating apparatus according to Claim 15, wherein said feedback signal delay unit is a digital filter.

22. A distortion compensating apparatus according to Claim 15, wherein said feedback signal delay unit is a sampling clock phase variable circuit for varying the phase of a sampling clock of an AD converter which is inserted into a feedback system.